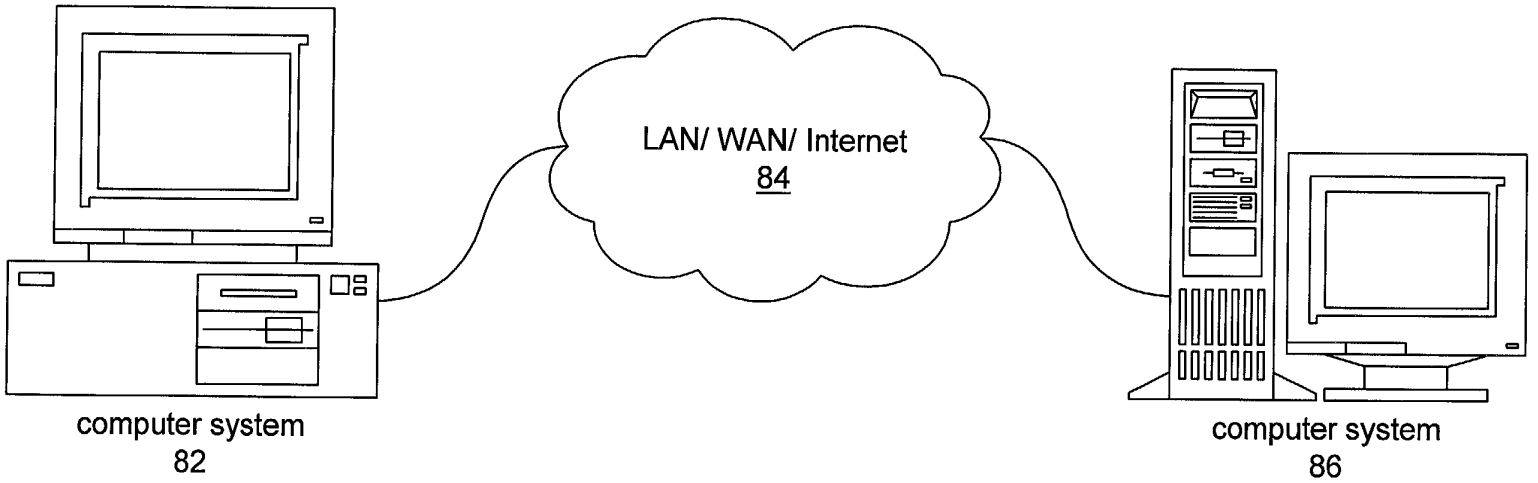


FIG. 1

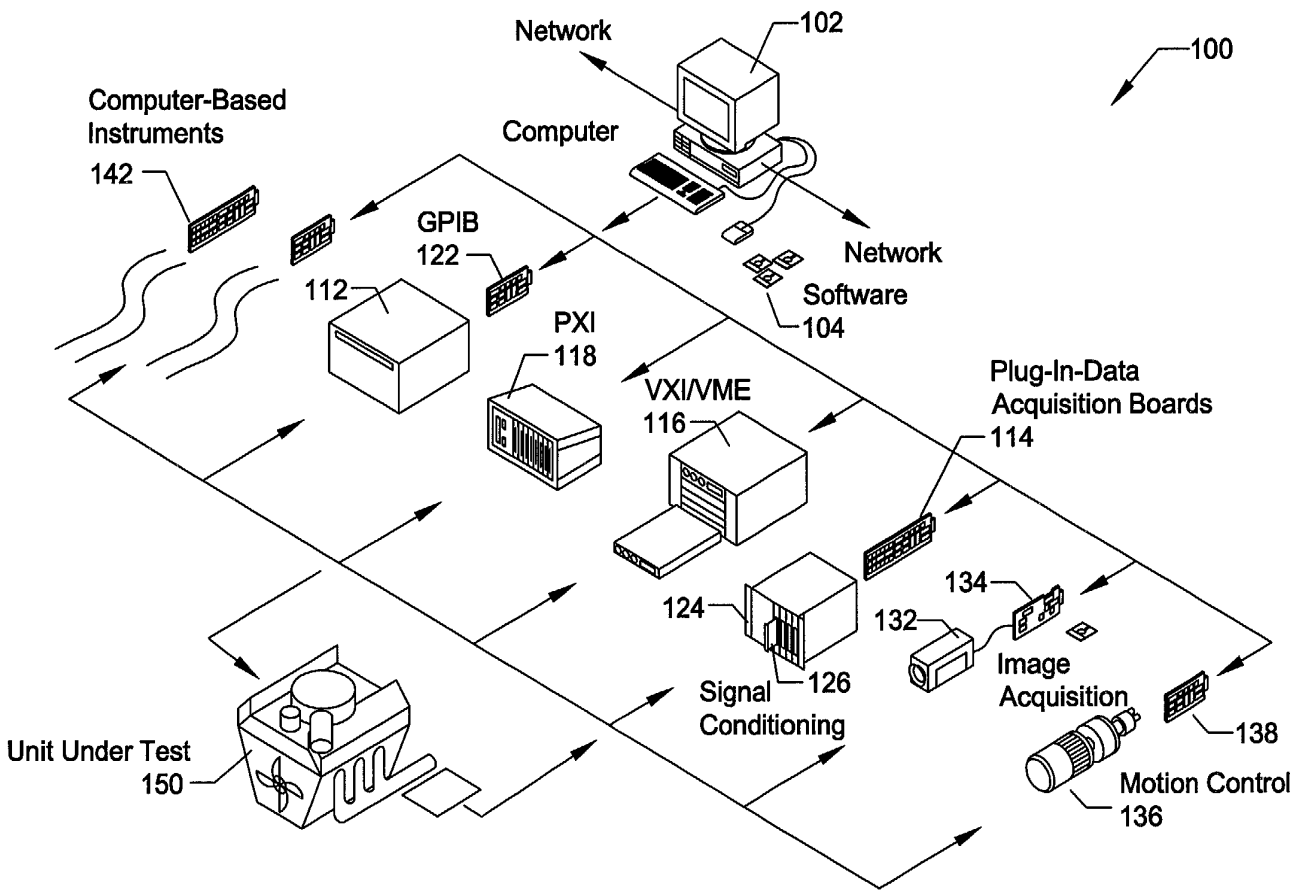

Network
102
100
Computer-Based
Instruments
142
Computer
GPIB
122
112
Network
Software
104
PXI
118
VXI/VME
116
Plug-In-Data
Acquisition Boards
114
134
124
132
Image
Acquisition
Signal
Conditioning
126
138
Unit Under Test
150
Motion Control
136

FIG. 2A

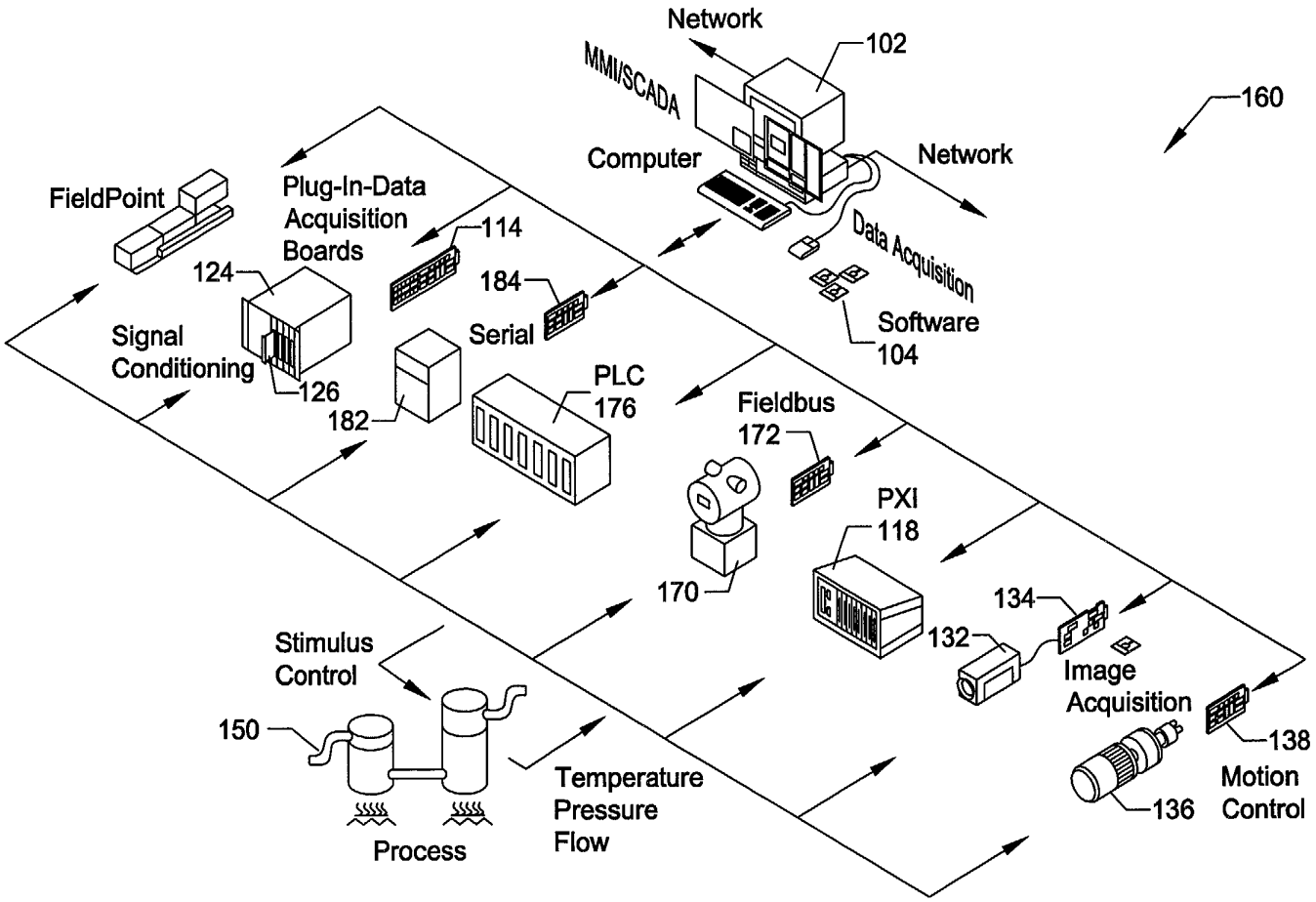

Network
102
MMI/SCADA
Computer
Network
160
Data Acquisition
Software
104
FieldPoint
Plug-In-Data
Acquisition
Boards
114
124
184
Serial
Signal
Conditioning
126
182
PLC
176
Fieldbus
172
PXI
118
170
134
132
Image
Acquisition
138
Motion
Control
136
Stimulus
Control
150
Temperature
Pressure
Flow
Process

FIG. 2B

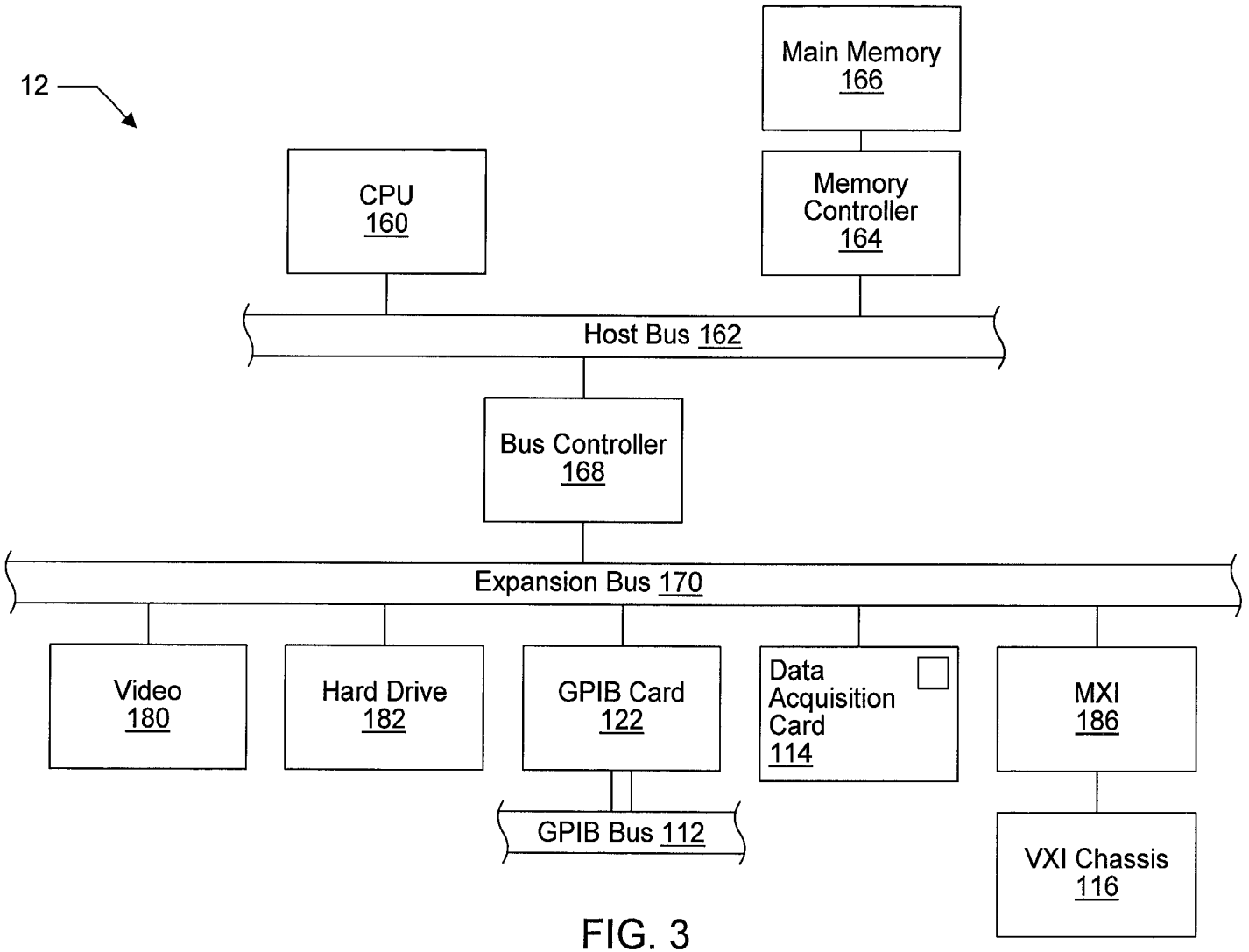

12
Main Memory
166
CPU
160
Memory
Controller
164
Host Bus 162
Bus Controller
168
Expansion Bus 170
Video
180
Hard Drive
182
GPIB Card
122
Data
Acquisition
Card
114
MXI
186
GPIB Bus 112
VXI Chassis
116

FIG. 3

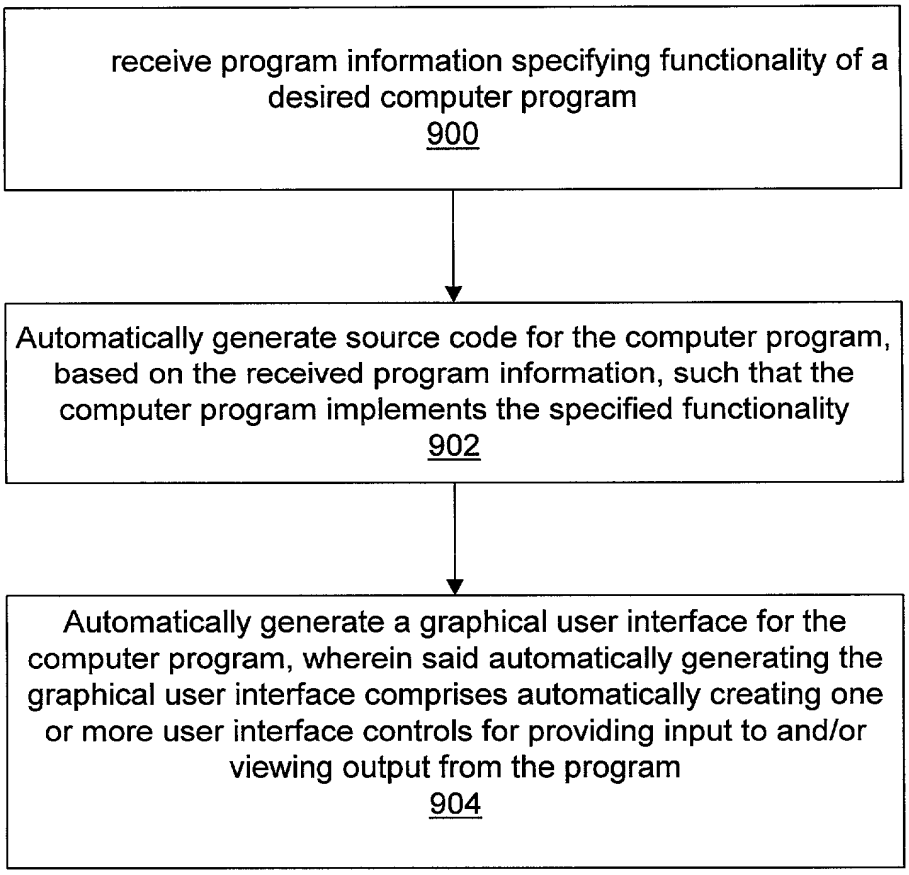

receive program information specifying functionality of a desired computer program
900
Automatically generate source code for the computer program, based on the received program information, such that the computer program implements the specified functionality
902
Automatically generate a graphical user interface for the computer program, wherein said automatically generating the graphical user interface comprises automatically creating one or more user interface controls for providing input to and/or viewing output from the program
904

FIG. 4

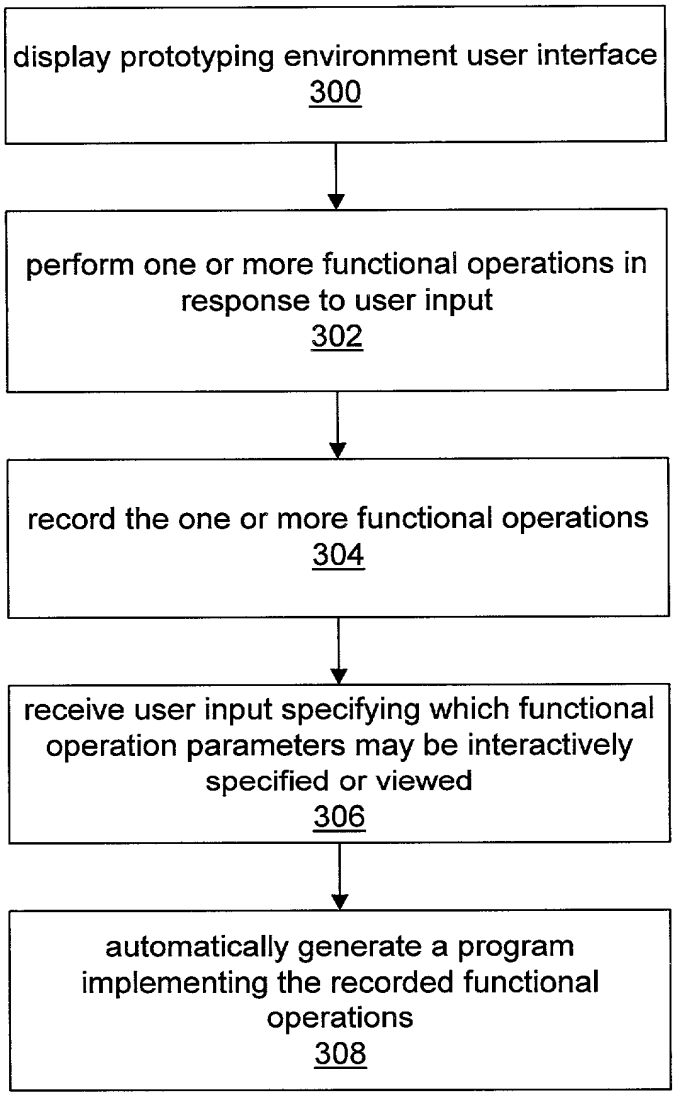

display prototyping environment user interface
300
perform one or more functional operations in response to user input
302
record the one or more functional operations
304
receive user input specifying which functional operation parameters may be interactively specified or viewed
306
automatically generate a program implementing the recorded functional operations
308

FIG. 5

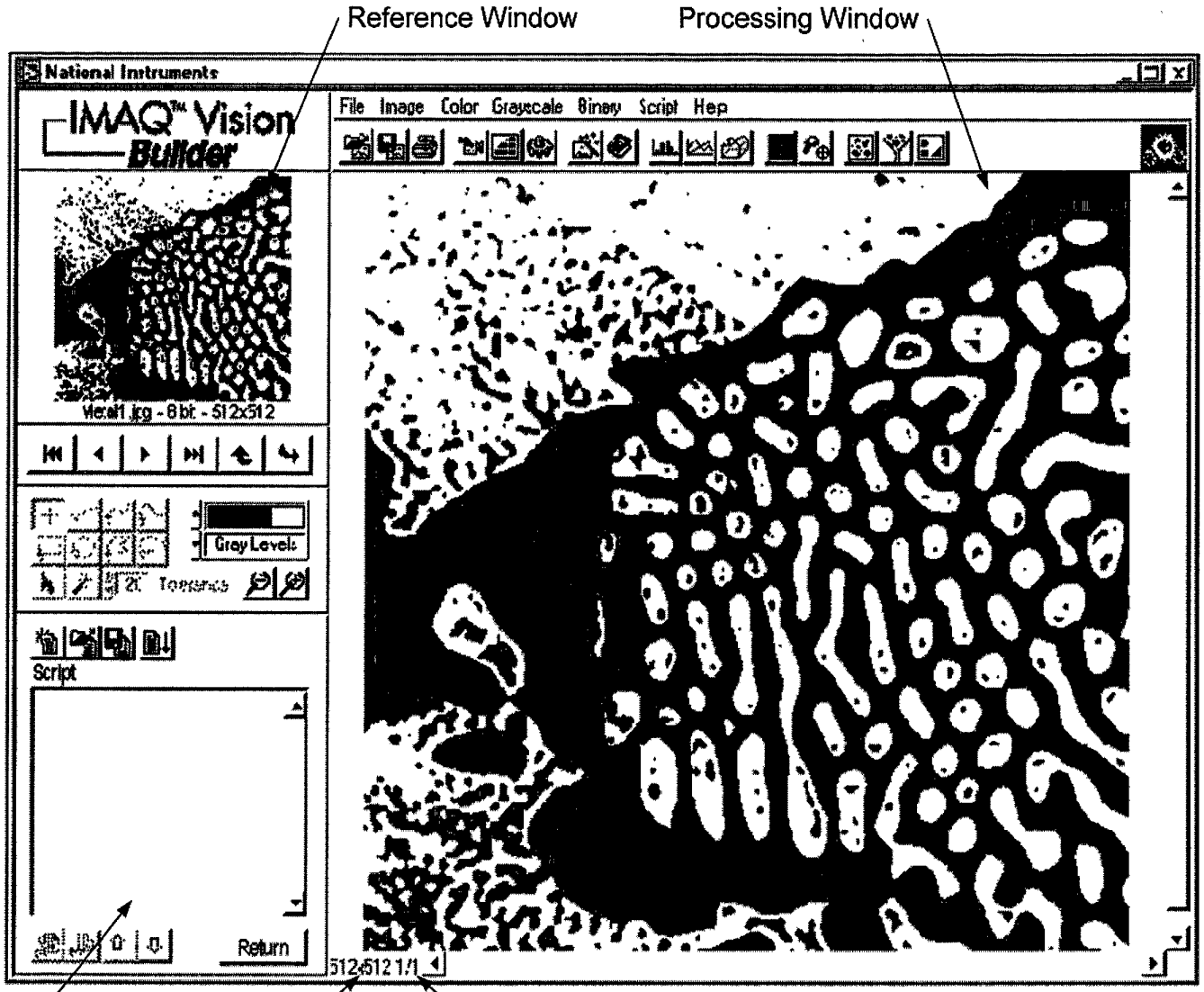

Reference Window
Processing Window
National Instruments
IMAQ™ Vision Builder
File Image Color Grayscale Binary Script Help
Gray Level:
Script
Return
512x512 1/1
Script Window
Image Size
Zoom Ratio

FIG. 6

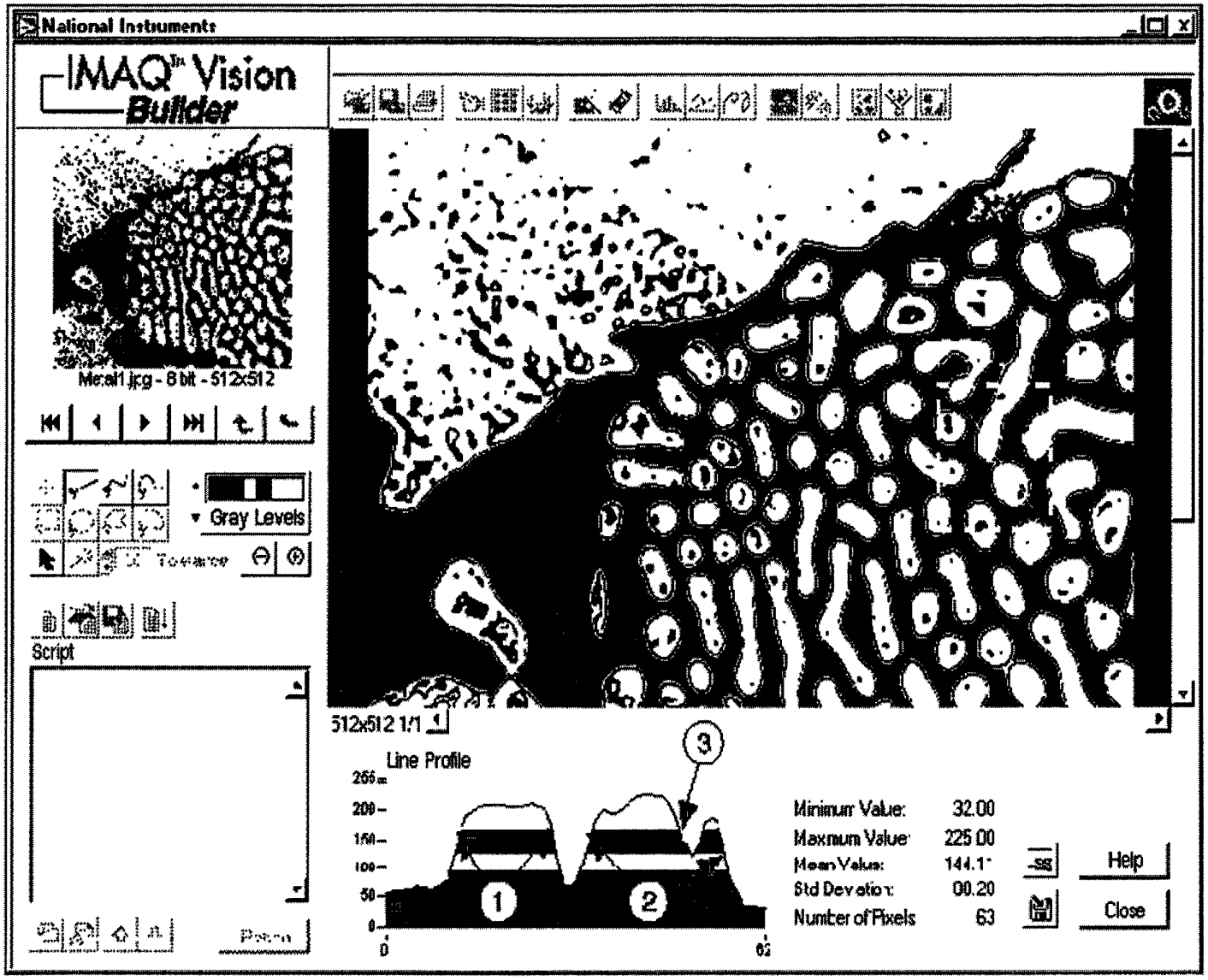

National Instruments
IMAQ Vision Builder
Metal1.jpg - 8 bit - 512x512
Gray Levels
Script
512x512 1:1
Line Profile
Minimum Value: 32.00
Maximum Value: 225.00
Mean Value: 144.11
Std Deviation: 00.20
Number of Pixels 63
Help
Close

FIG. 7

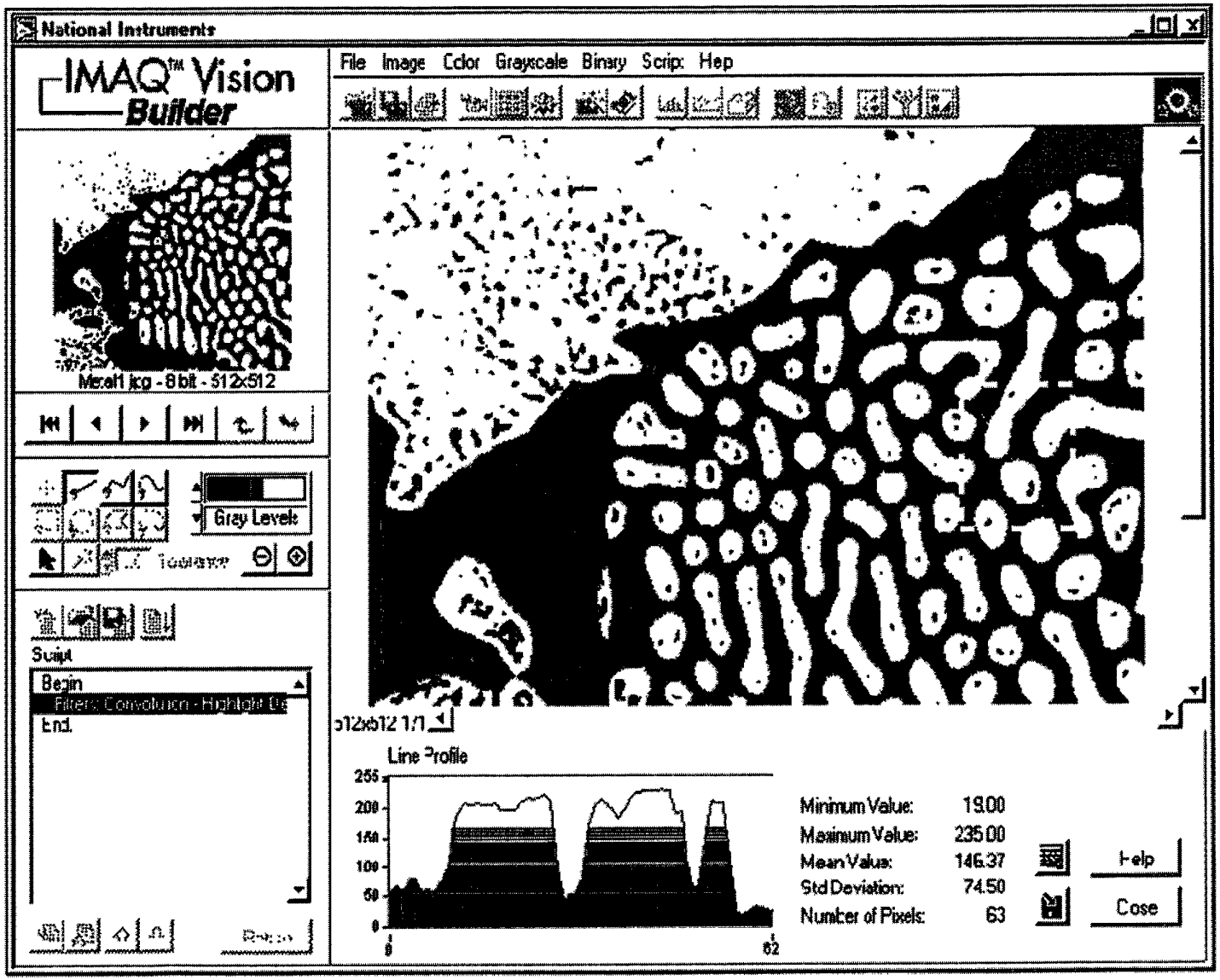

National Instruments
IMAQ™ Vision Builder
File Image Color Grayscale Binary Script Help
Merell.jpg - 8 bit - 512x512
Gray Levels
Script
Begin
End
Line Profile
255
200
150
100
50
0
0
62
Minimum Value: 19.00
Maximum Value: 235.00
Mean Value: 146.37
Std Deviation: 74.50
Number of Pixels: 63
Help
Close

FIG. 8

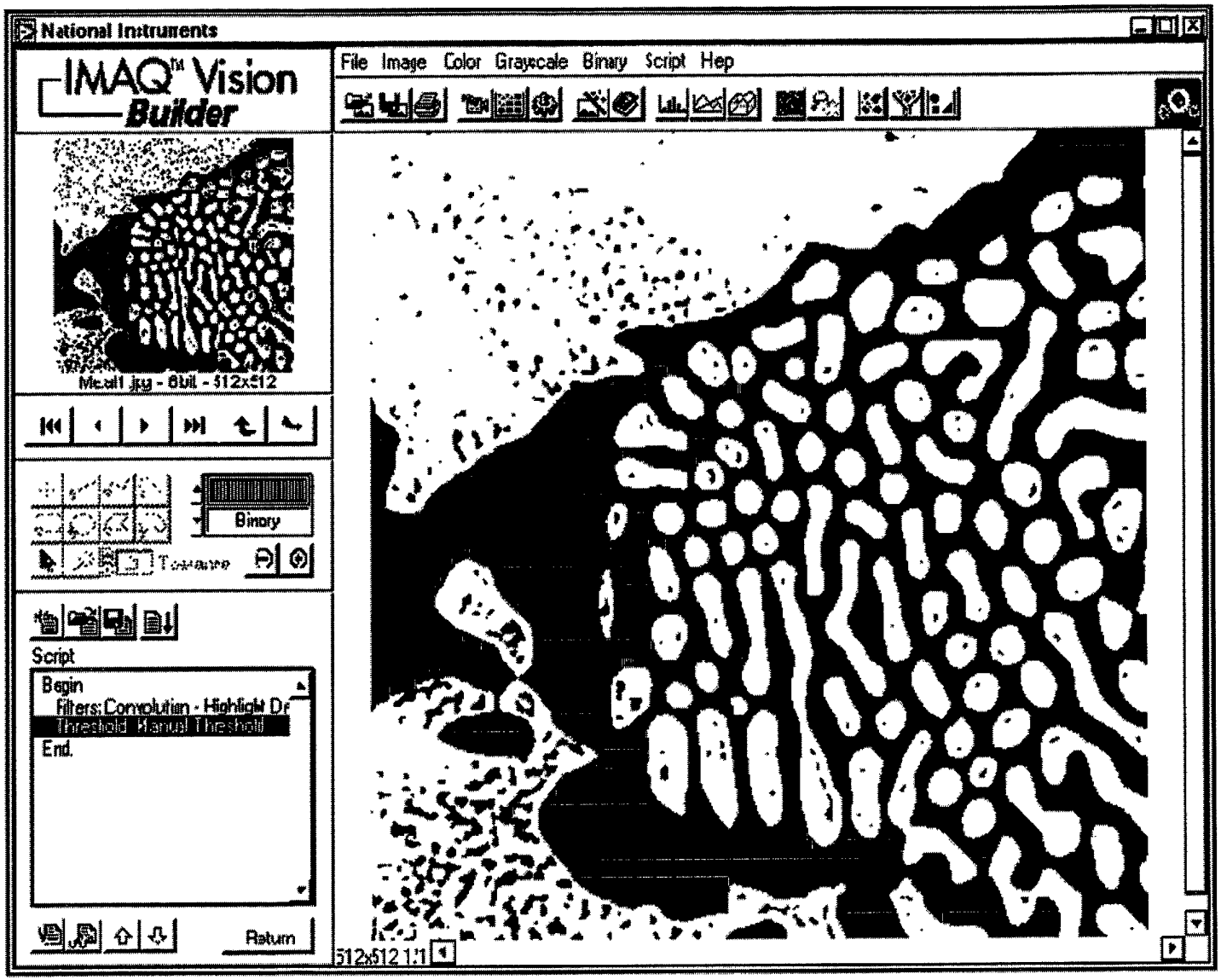

National Instruments
IMAQ™ Vision Builder
File Image Color Grayscale Binary Script Help
Metal1.jpg - 8bit - 512x512
Binary
Script
Begin
Filters:Convolution - Highlight Df
Threshold:Manual Threshold
End.
Return
512x512 1:1

FIG. 9

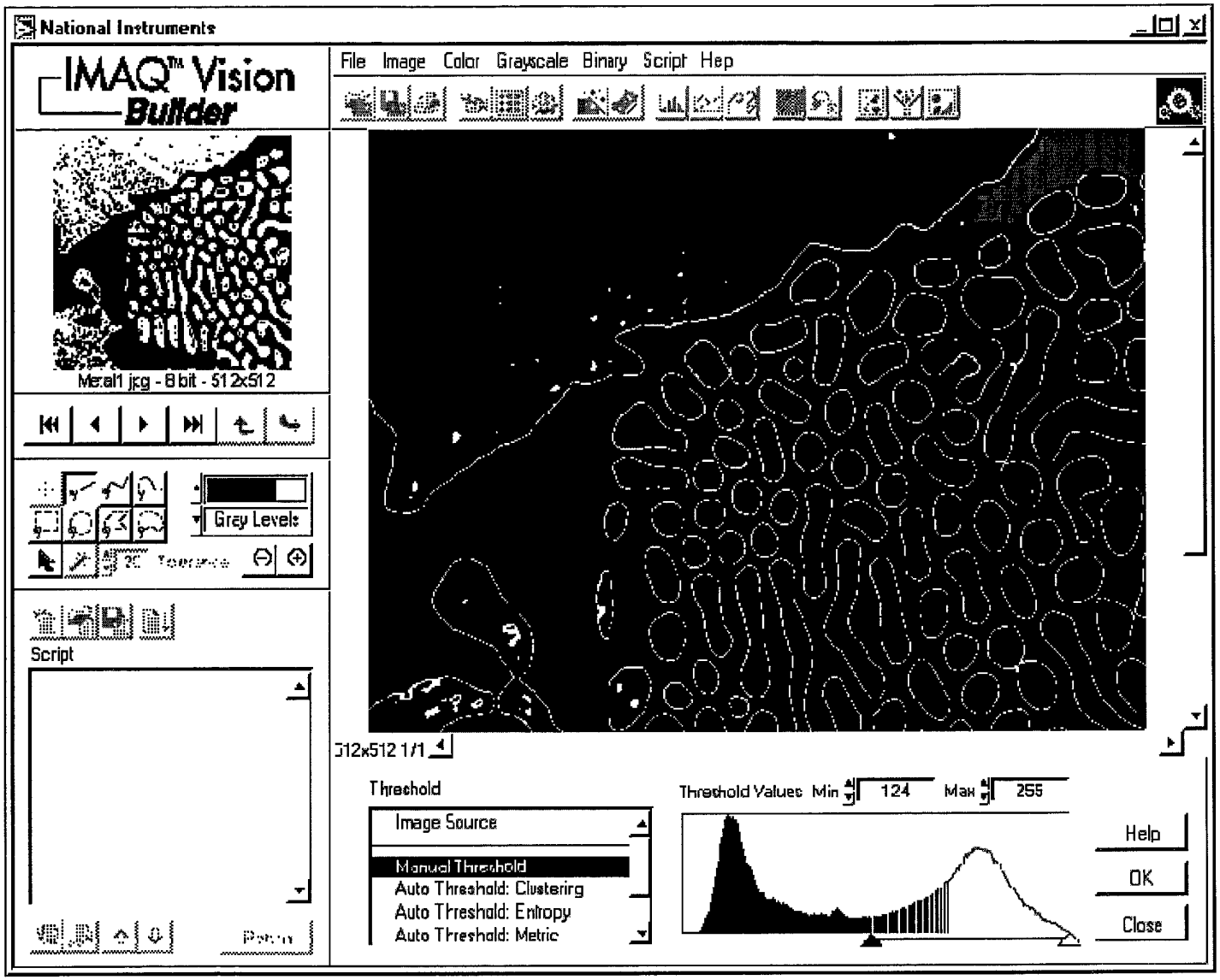

National Instruments
IMAQ™ Vision Builder
File Image Color Grayscale Binary Script Help
Metal1.jpg - 8 bit - 512x512
Grey Levels
Script
512x512 1/1
Threshold
Image Source
Manual Threshold
Auto Threshold: Clustering
Auto Threshold: Entropy
Auto Threshold: Metric
Threshold Values Min 124 Max 255
Help
OK
Close

FIG. 10

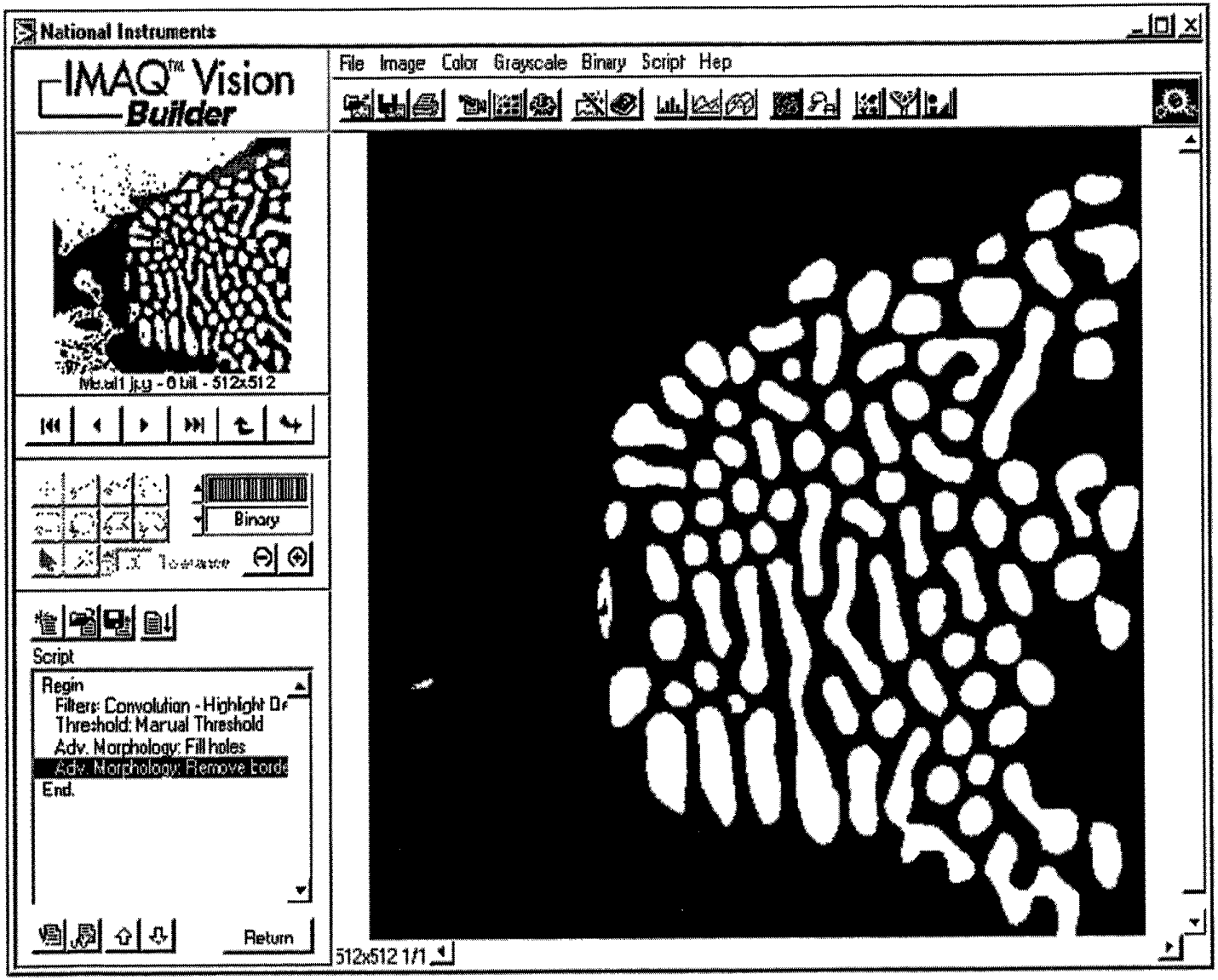

National Instruments
IMAQ™ Vision Builder
File Image Color Grayscale Binary Script Help
Metal1.jpg - 8 bit - 512x512
Binary
Script
Regin
Filters: Convolution - Highlight D
Threshold: Marual Threshold
Adv. Morphology: Fill holes
Adv. Morphology: Remove Borde
End.
Return
512x512 1/1

FIG. 11

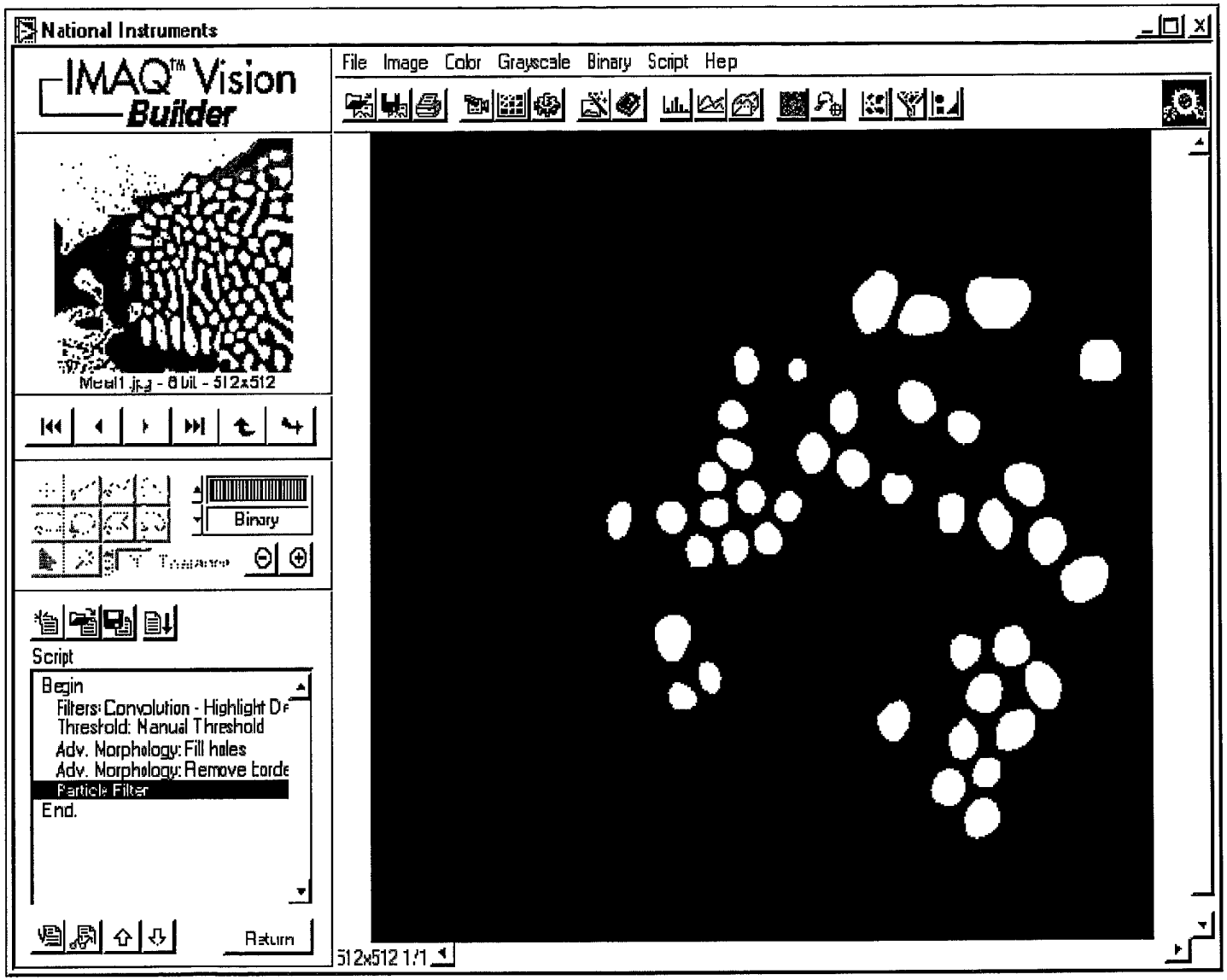
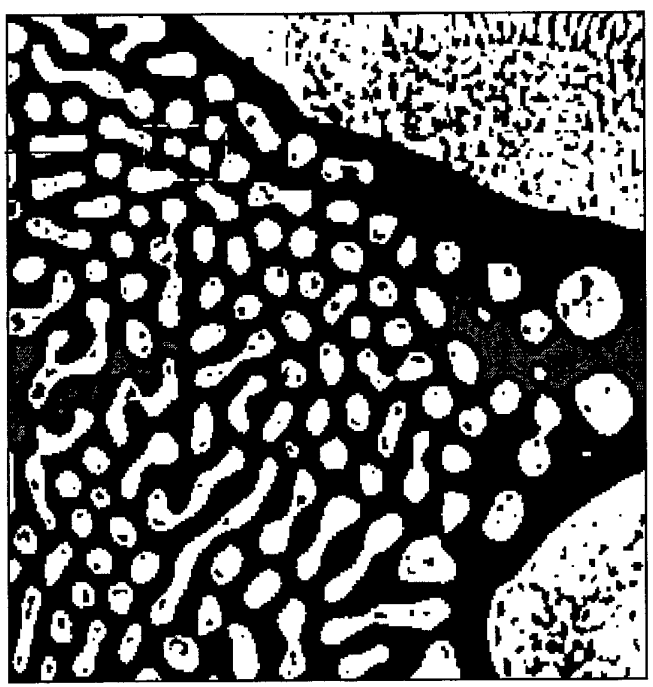

National Instruments
IMAQ™ Vision Builder
File Image Color Grayscale Binary Script Help
Metal1.jpg - 8 bit - 512x512
Binary
Script
Begin
Filters: Convolution - Highlight D
Threshold: Manual Threshold
Adv. Morphology: Fill holes
Adv. Morphology: Remove borde
Particle Filter
End.
Return
512x512 1/1

FIG. 12

092567279 "4129260



Original Image (Metal3.jpg)

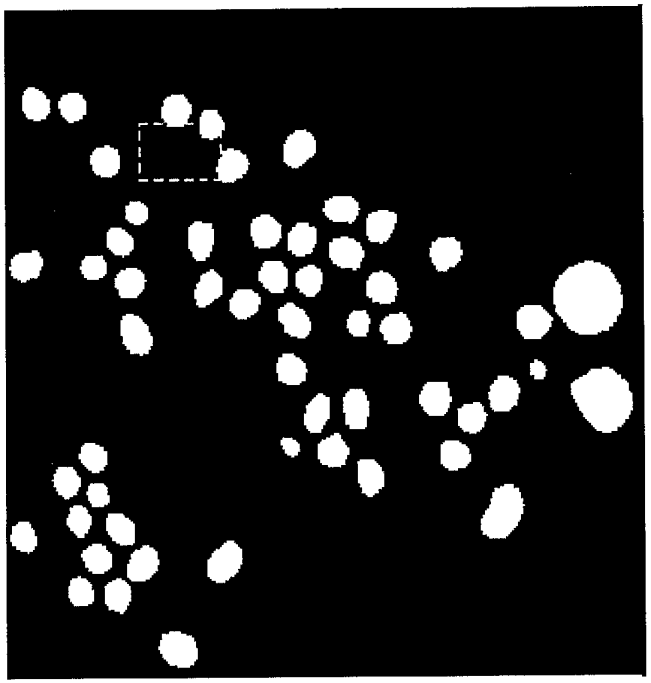


Image after Processing

FIG. 13

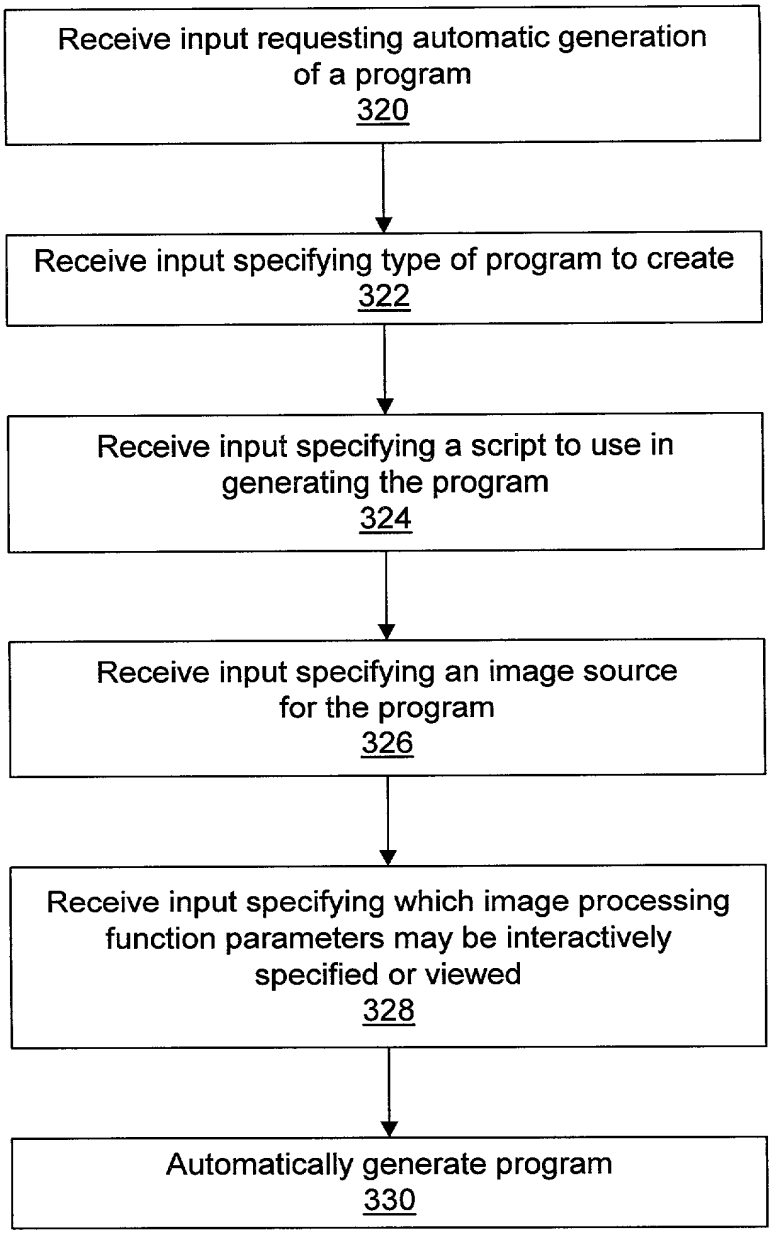

Receive input requesting automatic generation of a program
320
Receive input specifying type of program to create
322
Receive input specifying a script to use in generating the program
324
Receive input specifying an image source for the program
326
Receive input specifying which image processing function parameters may be interactively specified or viewed
328
Automatically generate program
330

FIG. 14

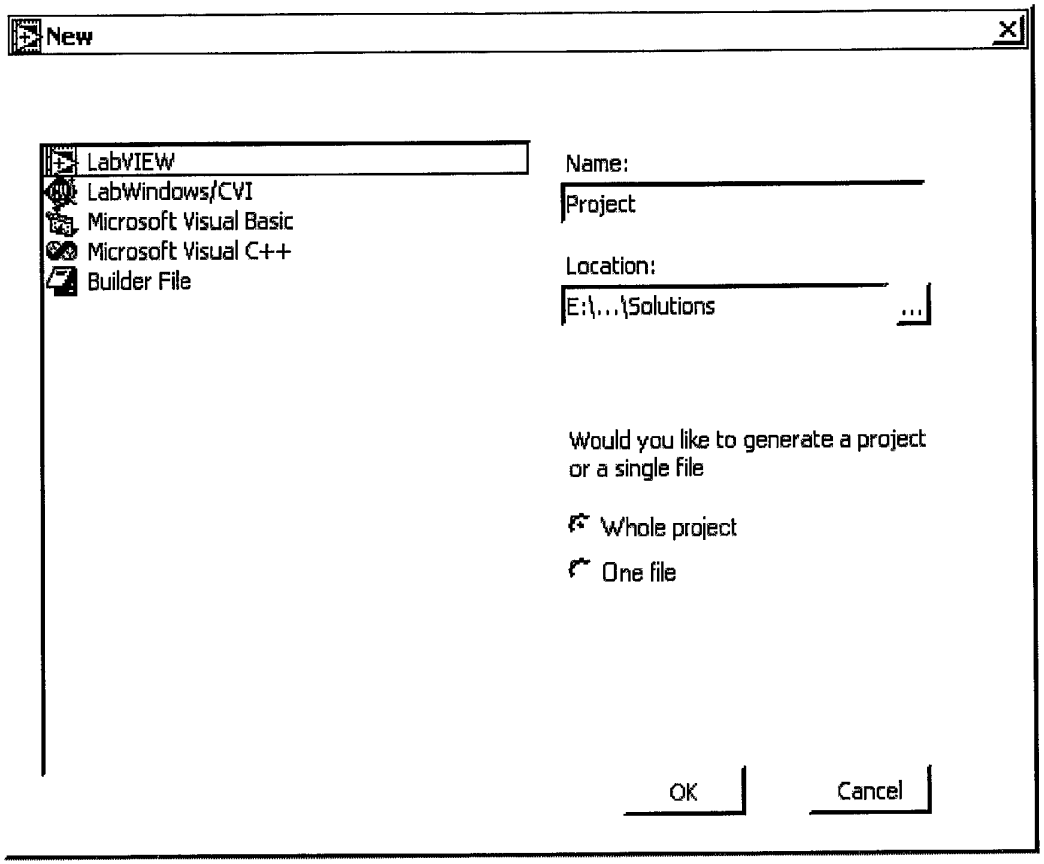

New
LabVIEW
LabWindows/CVI
Microsoft Visual Basic
Microsoft Visual C++
Builder File
Name:
Project
Location:
E:\...\Solutions
...
Would you like to generate a project or a single file
Whole project
One file
OK
Cancel

FIG. 15

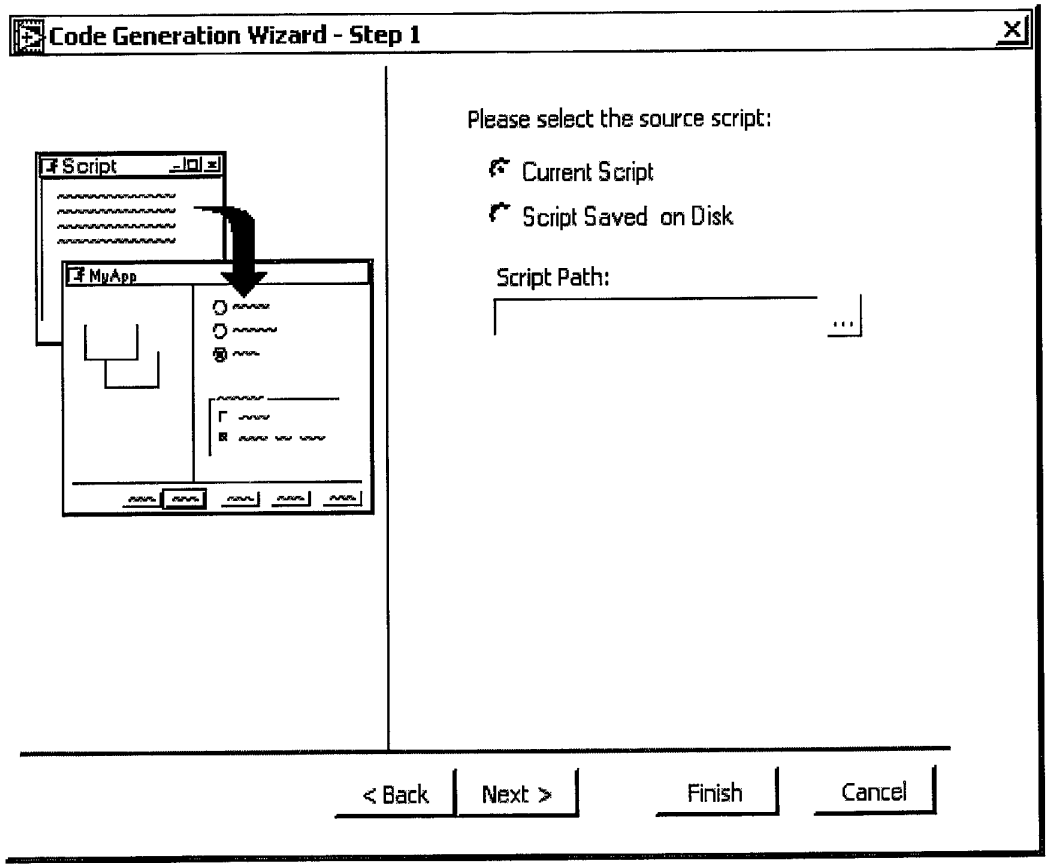

Code Generation Wizard - Step 1
Script
MyApp
Please select the source script:
Current Script
Script Saved on Disk
Script Path:
...
< Back
Next >
Finish
Cancel

FIG. 16

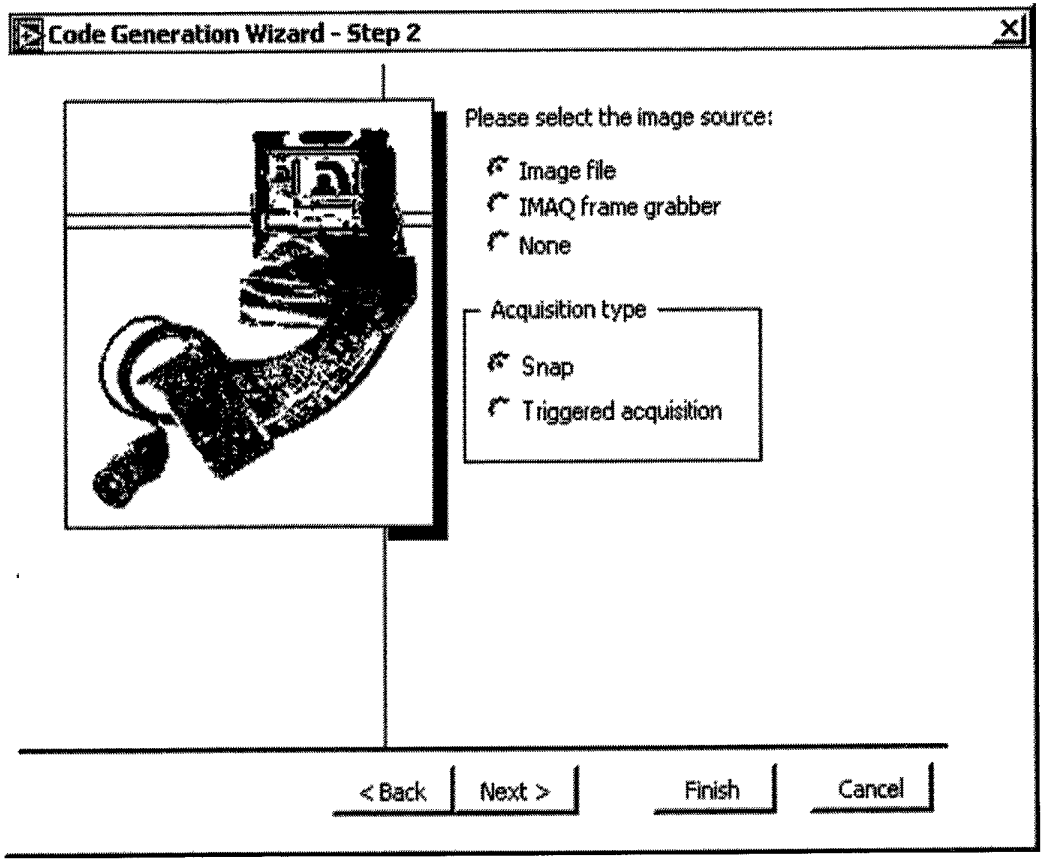

Code Generation Wizard - Step 2
Please select the image source:
Image file
IMAQ frame grabber
None
Acquisition type
Snap
Triggered acquisition
< Back
Next >
Finish
Cancel

FIG. 17

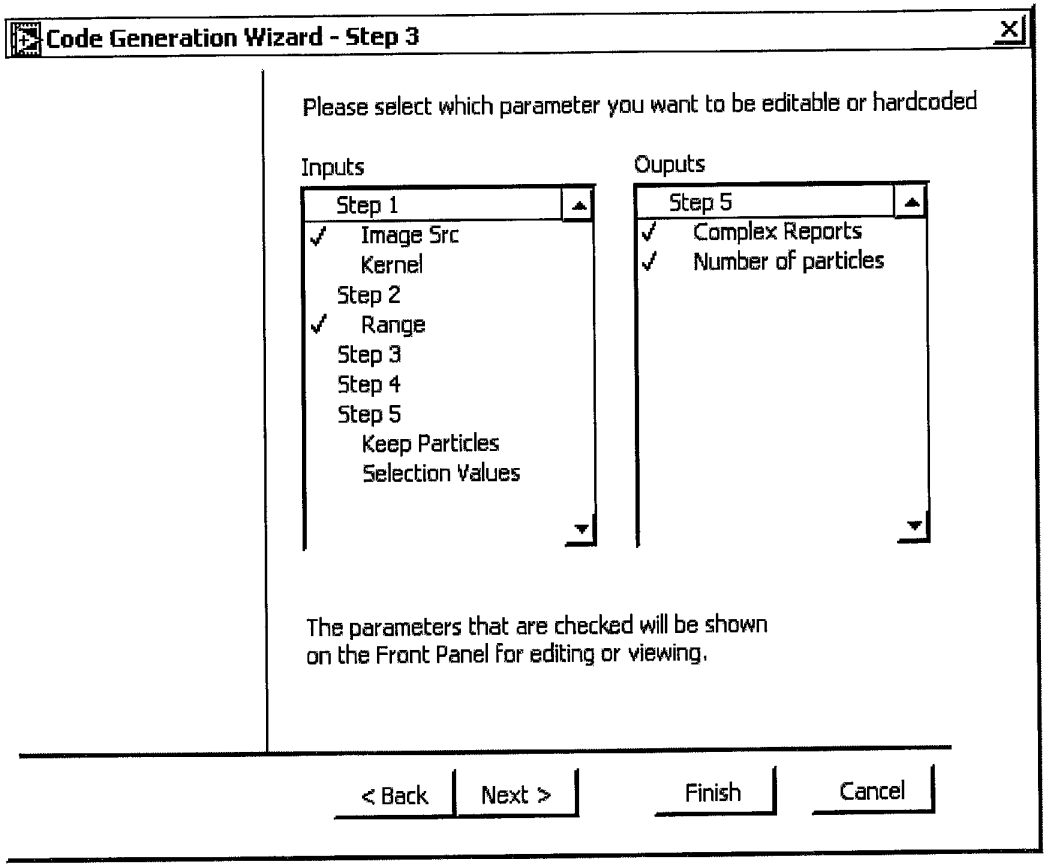

Code Generation Wizard - Step 3
Please select which parameter you want to be editable or hardcoded
Inputs
Step 1
✓ Image Src
Kernel
Step 2
✓ Range
Step 3
Step 4
Step 5
Keep Particles
Selection Values
Ouputs
Step 5
✓ Complex Reports
✓ Number of particles
The parameters that are checked will be shown on the Front Panel for editing or viewing.
< Back
Next >
Finish
Cancel

FIG. 18

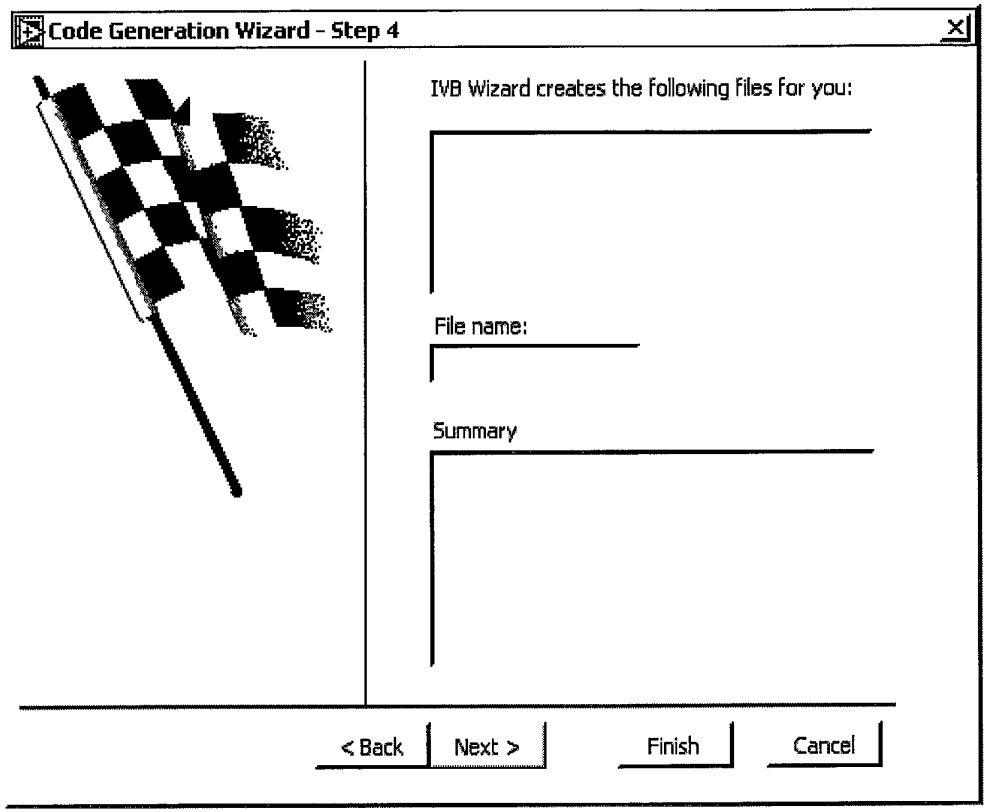

Code Generation Wizard - Step 4
IVB Wizard creates the following files for you:
File name:
Summary
< Back
Next >
Finish
Cancel

FIG. 19

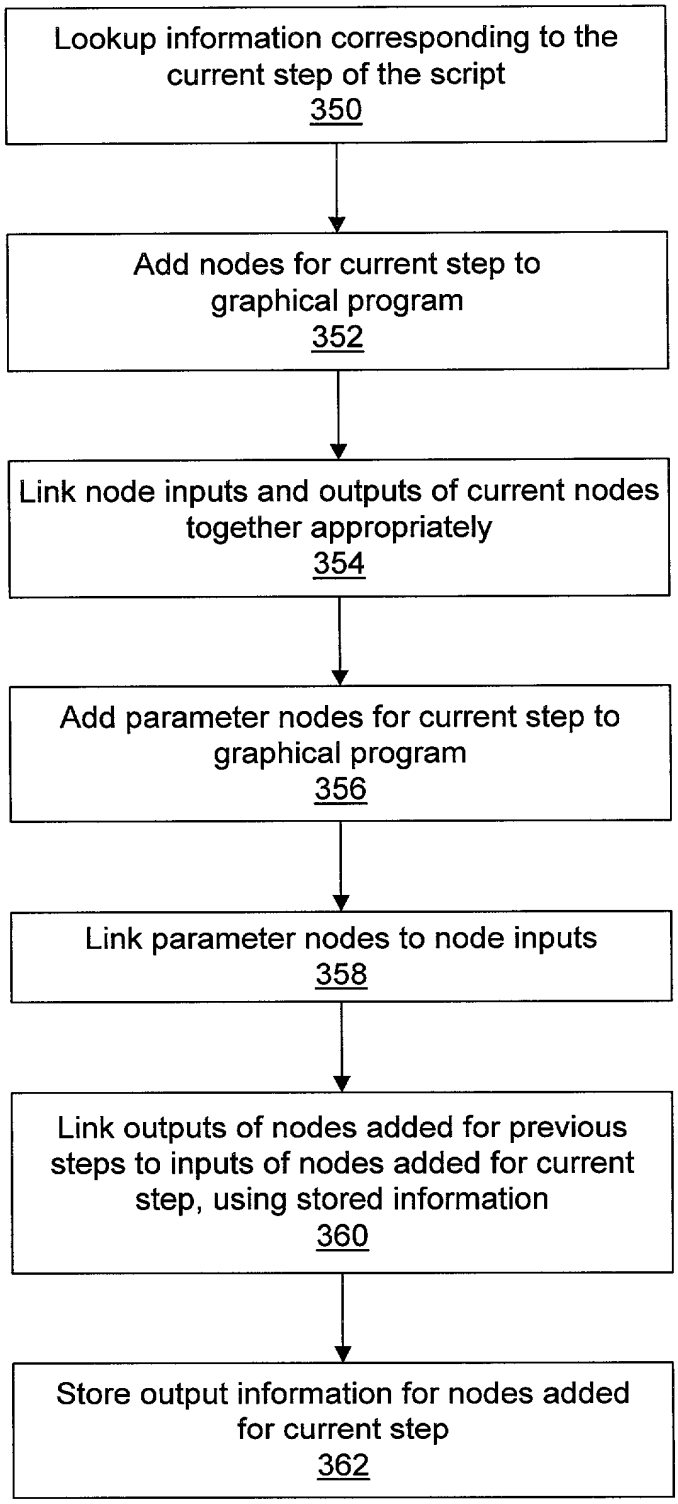

Lookup information corresponding to the current step of the script
350
Add nodes for current step to graphical program
352
Link node inputs and outputs of current nodes together appropriately
354
Add parameter nodes for current step to graphical program
356
Link parameter nodes to node inputs
358
Link outputs of nodes added for previous steps to inputs of nodes added for current step, using stored information
360
Store output information for nodes added for current step
362

FIG. 20

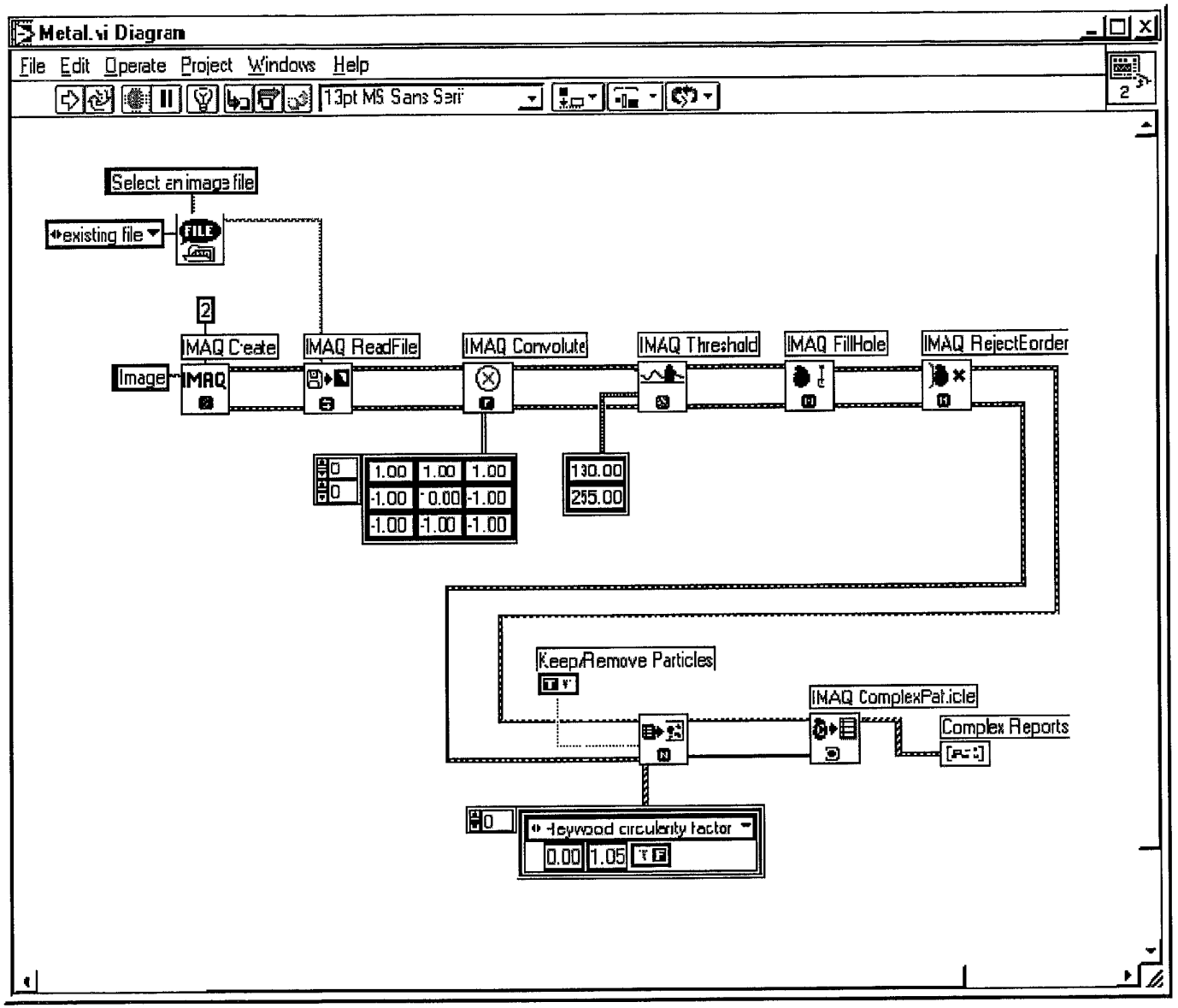

Metal.vi Diagram
File Edit Operate Project Windows Help
13pt MS Sans Serif
Select an image file
existing file
2
IMAQ Create
IMAQ ReadFile
IMAQ Convolute
IMAQ Threshold
IMAQ FillHole
IMAQ RejectBorder
Image
IMAQ
1.00 1.00 1.00
-1.00 0.00 -1.00
-1.00 -1.00 -1.00
130.00
255.00
Keep/Remove Particles
IMAQ ComplexParticle
Complex Reports
Heywood circularity factor
0.00 1.05

FIG. 21

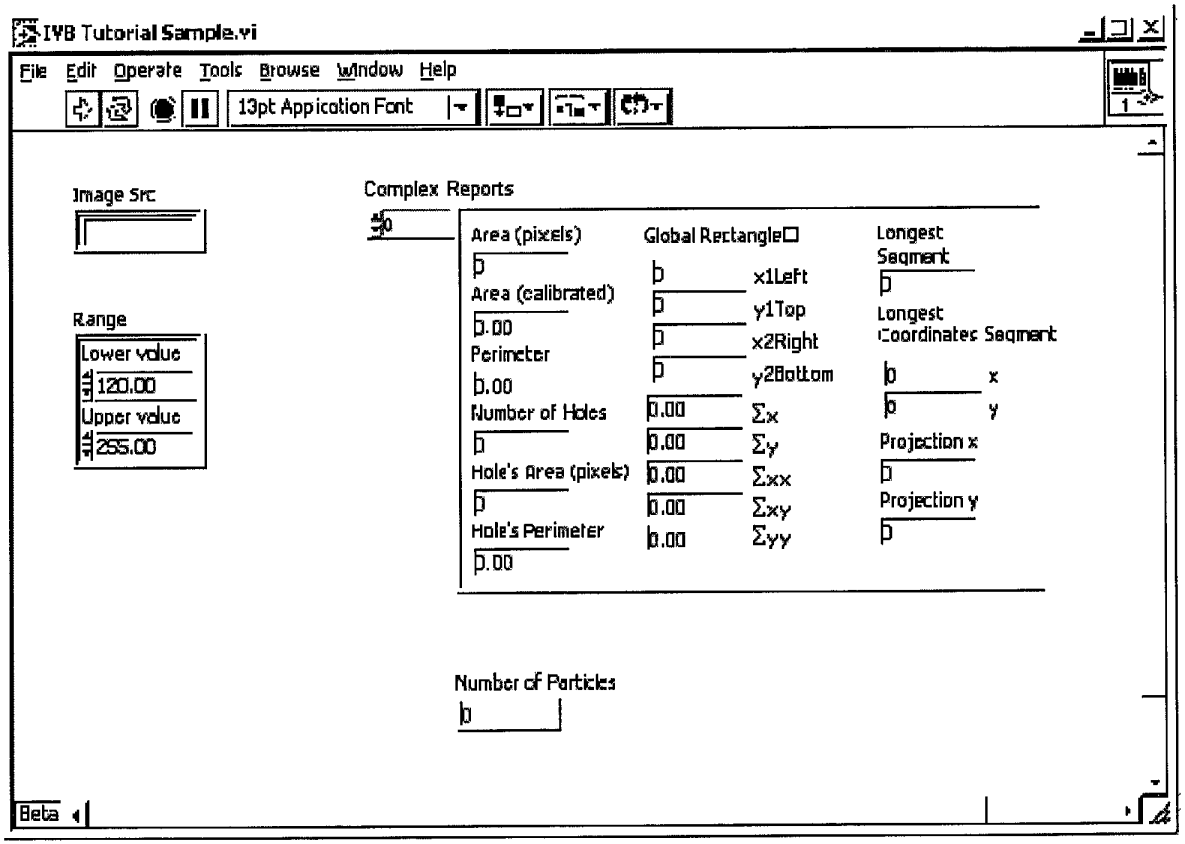

IVB Tutorial Sample.vi
File Edit Operate Tools Browse Window Help
13pt Application Font
Image Src
Range
Lower value
120.00
Upper value
255.00
Complex Reports
Area (pixels)
Area (calibrated)
0.00
Perimeter
0.00
Number of Holes
Hole's Area (pixels)
Hole's Perimeter
0.00
Global Rectangle
x1Left
y1Top
x2Right
y2Bottom
0.00 Σx
0.00 Σy
0.00 Σxx
0.00 Σxy
0.00 Σyy
Longest Segment
Longest Segment Coordinates
x
y
Projection x
Projection y
Number of Particles
Beta

FIG. 22